PLANT AND SOIL NEMATODES

NEMATODE-FREE PLANTING MATERIAL: AN IMPORTANT COMPONENT OF AN INTEGRATED NEMATODE MANAGEMENT PROGRAM

Plant-parasitic nematodes can be found in the seeds, tubers, corms, or seedlings of many crops. Consequently, clean planting material plays an important role in preventing these nematodes being spread to new locations or damaging the newly planted crop. This fact sheet provides some examples of the use of nematode-free planting material against several quite different nematode pests.

Potato cyst nematode on potato

The potato cyst nematode, *Globodera rostochiensis*, commonly referred to as PCN, is a serious pest of potatoes throughout the world. In Australia, PCN is only found in Victoria and so stringent quarantine regulations have been established to prevent it spreading to other states and territories (see Fact sheet PCN 053). One of the key components of this regulatory program is to provide growers with access to PCN-free planting material. This is done through a seed certification scheme that not only aims to ensure freedom from PCN, but also minimises the risk of transferring a range of fungal, bacterial, and viral diseases with the seed. Thus, growers wishing to produce certified seed potatoes must grow the crop in fields that meet specified requirements and their produce must be inspected for disease symptoms and the presence of virus vectors before being certified.

From a PCN perspective, land can only be used for certified seed production if it meets several criteria which ensure that the nematode is not present. Also, fields must be sampled, the soil forwarded to an accredited nematology laboratory, and a negative result obtained before seed crops can be assessed for certification. Fields which are linked in some way to PCN infested fields (e.g. through common management or shared machinery) will not be certified.

Although PCN-free planting material is only one of the practices used in the potato industry to prevent PCN being spread from Victoria, it is one of the reasons that no new infestations of PCN have been reported in Australia since 2008.

Root-knot nematode on ginger

Root-knot nematode is one of the most damaging pests of ginger because the symptoms it produces on rhizomes (galling, water-soaked lesions, and scarring) affect the quality of the marketable product. Another reason why root-knot nematode is important is that when it is present in the rhizomes used as planting material, the newly planted crop will suffer heavy losses from the nematode. Consequently, hot water treatment, a control measure developed in the 1960s, was commonly used in the 20th century to obtain nematode-free seed. Seed pieces were dipped in hot water (48°C) for 20 minutes because many studies showed that this eliminated the nematode without affecting seed germination.

In about 2002, some ginger growers began using a tissue-culture method to produce seed that was not only free of root-knot nematode but also *Fusarium oxysporum* f. sp. *zingiberi*, another important soilborne pathogen of ginger. Tissue-cultured material was planted in a pot containing sterilised potting mix and grown in a nursery. Once the plants were established, these 'plugs' were purchased by the grower and planted in an on-farm mother block that was free of the two pathogens. These plants produced many small 'knobs' that could be used in the following year to establish the main crops on the farm.

Provided clean 'plugs' are sourced from a tissue-culture nursery every season, the mother block is isolated from other ginger fields and is disease-free, and growers ensure that the key pathogens are not introduced to their mother block, large quantities of clean ginger planting material can be produced using this method.

Burrowing nematode and spiral nematode on banana

In the early 1990s, most banana planting material was sourced from fields that were taken out of production because of low productivity. As burrowing nematode (*Radopholus similis*) and other damaging plant-parasitic nematodes (e.g. spiral nematode, *Helicotylenchus multicinctus*) were often present in this vegetative material, it was then treated with either hot water or a nematicide. However, these treatments were usually not entirely effective because the nematodes were often present at very high population densities. Methods of producing tissue-cultured banana plantlets that are free of soilborne pathogens were then developed and widely used by growers, as they were not only free of the key nematode pests but also performed well when planted in the field. The quality of tissue-cultured material is now monitored under an industry-managed quality assurance scheme and growers either use it to establish their plantations, or establish their own nurseries dedicated to producing vegetative planting material that is free of nematodes.

Citrus nematode on citrus

Citrus nematode (*Tylenchulus semipenetrans*) is the most important nematode pest of citrus and prior to about 1960, it was spread to many regions in Australia because citrus nurseries were infested with the nematode (see fact sheet PSN 032). Nematode-free planting material then became available, and so planting material could be purchased from nurseries that were certified as being free of the nematode. Thus, most of the citrus plantations established in the last fifty years are not infested with citrus nematode.

Summary

The programs discussed above are some of the many successful examples of the use of nematode-free planting material in Australia. Such programs are very important in crops where bulbs, corms, tubers, and seedlings are planted, because if the planting material is infested, the newly planted crop is likely to suffer nematode damage. They are also important in tree and vine crops because new nematode species or pathotypes can be introduced to a farm when planting material obtained from a nursery is not certified as being free of damaging nematodes.

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